

## A STUDY OF THE NORTH AMERICAN EUMASTACINAE (ORTHOPTERA; ACRIDIDAE)

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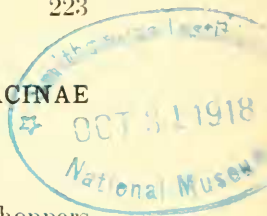
The subfamily Eumastacinae is an assemblage of grasshoppers which to-day comprises about forty-five genera and approximately one hundred and fifty species. The group is clearly of tropical origin, and is represented by a far greater number of forms in both the Oriental and African regions than in the American tropics. In the Old World representatives are found as far north as Turkestan, Kashmir, Bhotan, Yunnan, China and Japan, while in Africa no species have been reported from north of the tropical area. In North America, north of Mexico, a single genus and species has been known from California for some years, but since its description in 1898 little additional information has been published regarding it.

In the field studies made within the United States by the present authors, we have always paid particular attention to eumastacids when we found them present at a locality. In consequence we have before us a very considerable series of the subfamily from the United States, largely of our own collecting and all contained in the Philadelphia collections. Careful study shows that two genera are present, *Morsea*, which was previously known, and a new one related to it, while the single species of *Morsea* is found divisible into three geographic races, one of which is found considerably to the eastward of the previously known range of the genus.

The features of the subfamily have been discussed by Burr in his last summary of the group.<sup>1</sup> At this writing, without a broader personal knowledge of the exotic genera, it seems undesirable to re-diagnose the subfamily, the recognition of which will not cause difficulty on account of the distinctive and in fact often remarkable form of the species.

In the United States the subfamily occurs only in the southwestern states, north as far as the vicinity of San Francisco (Mt. Tamalpais), California, southeastern Nevada (Crestline and Caliente) and from the Pacific Coast area east to central Arizona

<sup>1</sup> Genera Insect., Orth., Eumastac., pp. 1 to 2, (1903).



(vicinity of Prescott). In much of this area it is not present, requiring favorable zonal conditions for its occurrence. Both of our genera are almost entirely limited to the Upper Sonoran Life Zone in their distribution. Nothing whatever is known of the distribution of the two North American genera south of the Mexican line.

Both of the genera found in the United States belong to the section Eumastaces, or restricted subfamily Eumastacinae if the group is called a family (Eumastacidae), as done by Burr. Their relationship is clearly with *Masyntes* Karsch, as indicated by Scudder and Burr in the case of *Morsea*, no close affinity existing with *Eumastax*, *Paramastax* and *Scirtomastax*, the other genera of the section. Our two genera are, however, much more nearly related to one another than either one is to the West Indian and South American *Masyntes*. Both genera are completely apterous, without continuous or definite lateral carinae on the pronotum, the caudal margin of the disk of which is appreciably emarginate mesad, the fastigium is produced and entire, with the dorsal section of the frontal costa broadened. From *Masyntes*, *Morsea* and the new *Psychomastax* can be readily differentiated by having the spines of the internal margin of the caudal tibiae uniform in length, by their apterous condition and entire and produced fastigium.<sup>2</sup>

In habits all the forms found within the territory considered are thamnophilous, being particularly fond of perching on the tops of various species of bushes, spiny or otherwise, which make up the chaparral of the western or coastal slopes of the southern Californian and Coast Range Mountains. In such situations you will, by careful scrutiny, find them with short antennae erect and parallel, caudal limbs akimbo, the whole insect picturing alertness and vigor. Their ability to jump is developed in full proportion

<sup>2</sup> A feature of interest in both of the genera here studied is the presence on the ventral surface of the ninth to tenth antennal joint of a distinct, though minute, spiniform tooth, in both sexes. In examining representatives of seven other genera of Eumastacinae we find a similar development indicated as follows:

Present on the eleventh segment in *Erianthus malcolmi*, ♂; *Erucius vitreus*, ♂ and ♀; *Erucius dimidiatipes*, ♂; *Masyntes gundlachi*, ♀.

Present on the twelfth segment in *Erucius magnificus*, ♂.

Present on the ninth segment in *Thericles gnu* and *quagga*, ♀.

Not indicated in *Brachytylus burri*, *Episactus brunneri* and *Masyntes tigris*.

to their very long and lever-like caudal limbs, as a single bound will often place them in a place of safety on a chamisal bush well out of reach, except by a new and cautious advance through the heavy brush, often with similar disappointing results. Steady and persistent beating, while by no means easy on account of the character of the cover, is probably the best method of securing series of these interesting little grasshoppers.

The two genera found in our territory may be distinguished by the following features:

A. Form slender. Head narrow in proportion to depth. Fastigium, in both sexes, projecting a distance at least one-third of width of same, when seen from dorsum, narrower; in profile fastigial angle is acute. Frontal costa very narrow and subequal mesad and ventrad, widened briefly dorsad. Antennae with tooth on ventral surface of tenth segment.<sup>3</sup> Lateral lobes of pronotum with ventro-caudal angle rounded rectangulate. Cerci of ♂ compressed and falcate ventrad in distal section. Subgenital plate of ♂ with a median linguiform process directed dorso-cephalad from disto-dorsal margin, which is entire. Limbs more elongate and slender. **Morsea** Scudder

AA. Form relatively robust. Head broader than in alternative. Fastigium, in both sexes, projecting less than one-third of the width of the same, when seen from the dorsum, broader; in profile fastigial angle is right-angled. Frontal costa of average width, widening dorsad. Antennae with tooth on ventral surface of ninth segment. Lateral lobes of pronotum with ventro-caudal angle not rounded, rectangulate. Cerci of ♂ simple, styliform. Subgenital plate of ♂ without a median linguiform process, disto-dorsal portion of plate made up of two lateral, mesad attingent sections.

**Psychomastax** new genus

In the series before us are present three hundred and eight specimens of the subfamily from the area under discussion, by far the greater portion belonging to the genus *Morsea*. As individuals of this group are very active and elusive, the series represents a far greater amount of persistent work than the number alone would suggest to those unacquainted with these active bush-loving insects.

<sup>3</sup> In *Morsea* this tooth occasionally appears to be on the eleventh segment, but this will be found to be due to an adventitious and incomplete division of the third segment.

**MORSEA** Scudder

1898. *Morsea* Scudder, Psyche, viii, p. 179.  
1899. *Morsea* Burr, Anal. Soc. Españ. Hist. Nat., xxviii, pp. 95, 277.  
1899. *Morsea* Scudder, Proc. Davenp. Acad. Nat. Sci., viii, p. 18.  
1901. *Morsea* Bruner, Biol. Cent.-Amer., Orth., ii, pp. 22, 24.  
1903. *Morsea* Burr, Gen. Insect., Orth., Eumastac., pp. 15, 17.  
1909. *Morsea* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1909, p. 420.  
1910. *Morsea* Kirby, Syn. Catal. Orth., iii, p. 79.

Genotype: *Morsea californica* Scudder.

*Description of Genus.*—Form elongate, slender, apterous. Head deep, narrow; face declivent; fastigium in profile acute-angulate, from dorsum projecting cephalad of eyes a distance not more than one-half of its width, margin of apex of fastigium entire, not divided, subtruncate; occiput and fastigium with a distinct but low medio-longitudinal carinula: frontal costa very narrow, subequal in width mesad and ventrad, widening regularly from the paired ocelli to fastigium: eyes large, very prominent in male: antennae thirteen-jointed, slender immediately distad of first and second joints, thence depressed and spatulate or subspatulate, apex briefly acute, ventral tooth on tenth segment. Pronotum distinctly (♂) or weakly (♀) longitudinal, dorsum tectate in female, more arcuate transverse in male; distinct median carina indicated, no true lateral carinae present, discontinuous and faint ridges giving a semblance of lateral carinae; caudal margin of pronotal disk with median V-emargination of variable distinctness. Apex of male abdomen recurved: supra-anal plate deflexed, elongate trigonal; cerci compressed, with falcate distal sections; subgenital plate short, forming a chitinous arch bearing a median linguiform process, this abruptly directed cephalad along the body axis and between the cerci. Interspace between the mesosternal lobes strongly transverse, narrowing cephalad; mesosternal lobes contiguous. Limbs slender: caudal femora with apices of genicular arches and dorsal carinula spiniferous, genicular lobes very minutely spinulose: caudal tibiae with spines of each series uniform in length, those of internal series shorter than external, internal distal spurs distinctly longer than external: caudal tarsi elongate, proximal joint but faintly shorter than second and third joints united; large arolia present.



*History.*—The genus was founded in 1898 on *Morsea californica*, being very briefly described from two specimens which were considered “possibly immature.” In the light of our present knowledge this appears very certain. The references between the date of the original description and 1909 contain no additional information. In the latter year Rehn and Hebard reported the capture of additional material of the genus and published the first figures of the same. These authors recognized a geographic race *Morsea californica tamalpaisensis* occurring on Mount Tamalpais, north-central California.

*Distribution.*—From north-central California (Mount Tamalpais), south in the chaparral belt of the Coast Range and adjacent lowlands to the mountains of southern California and portions of the lowlands at their bases (south to Nellie, San Diego County), not occurring as far as known on the eastern or desert slope; from south-eastern Nevada (Crestline and Caliente) southeast to central Arizona (vicinity of Prescott). No material has been taken in the desert areas between the two regions known to be inhabited by the genus.

*Remarks.*—The relatively extensive series before us is not as rich proportionately in adult material as we might care to have it. Also, on account of the fragility of the insects, perfect specimens are not the rule. However, the material clearly demonstrates that while a single species alone is present, it is divisible into three well-marked geographic races or subspecies. These are typical *Morsea californica* of the mountains of southern California, *M. c. tamalpaisensis* of the Mount Tamalpais region in the Coast Range north of San Francisco Bay and *M. c. dumicola* of the central Arizonan and higher southern Nevadan regions. The first two are known to intergrade in material from Del Monte, California, but no material from localities between the ranges of typical *californica* and *c. dumicola* is known, and the two forms are considered subspecies solely on the degree of difference.

In California the genus is a member of the presumably ancient chaparral fauna, while in Arizona and in Nevada it is present in what might be considered an equivalent of the same, although little definite or comparable information is available regarding

the relative antiquity of the faunas of the areas inhabited. It seems probable to us that the present distribution of the genus is due to two parallel lines of dispersal extending north from an original center in Mexico, where possibly the two forms, or others very closely related, will be found to intergrade. The absolute lack of Mexican information makes any further theorizing along these lines unwarranted at this time. Another possibility is that *Morsea* originally occurred in what is now the hot, arid Lower Sonoran Zone, and possibly in the mountains as well, that increasing aridity and temperature, with the competition of a new fauna and the elimination or great restriction of its preferred habitat, forced it into its present zonal position. Some slight evidence in support of this hypothesis might be found in the occurrence of the genus in "islands" within Lower Sonoran conditions, as at Roscoe, California, but this might be explained equally well as a downward extension from the adjacent San Gabriel Mountains, where the genus is widely distributed, along the course of the broad Tujunga Wash.

Considerable difficulty is experienced in determining accurately whether material of this genus is adult. Having no criterion of wing development we are largely forced to use the abdominal appendages as evidence. In the male sex this method is satisfactory, but in the female sex there is difficulty, as the ovipositor jaws and surrounding plates show little difference in the adult and in the instar preceding maturity. In this sex the general firmer texture of the chitin and absence of shrivelling will usually indicate the adult, but occasional specimens are not easily placed.

### *Key to Subspecies*

- A. Fastigium of ♂, when seen from dorsum, projecting cephalad of cephalic margin of eyes less than one-half of width of fastigium (pl. XII, figs. 12 and 13); fastigio-facial angle, seen in profile, acute but not in the least concave ventrad.<sup>4</sup> Antennae moderately expanded and subspatulate distad. Infra-ocular portion of genae in ♂ no deeper than one-half depth of eye, in ♀ equal to two-thirds of depth of eye. Lateral lobes of pronotum proportionately longer and more shallow. Cerci of ♂ proportionately more slender, moderately falcate distad.

<sup>4</sup> Occasional females of *M. c. californica* show a tendency of this sort, but this is apparently merely an individual fluctuation, as they are otherwise quite typical.

B. Facial line, when seen from side, more sharply inflated between antennae. Fastigio-facial angle less strongly acute (pl. XII, figs. 2 and 6), when seen from side. Eyes in latter view proportionately smaller and more angulate dorsad and ventrad. Limbs appreciably longer and more slender. Caudal tarsi proportionately longer.

***Morsea californica californica* Scudder**

BB. Facial line, when seen from side, more regularly arcuate in its entirety. Fastigio-facial angle more strongly acute (pl. XII, figs. 3 and 7), when seen from side. Eyes in lateral view proportionately longer and more rounded dorsad and ventrad. Limbs appreciably shorter and more robust. Caudal tarsi proportionately shorter.

***Morsea californica dunicola* new subspecies**

AA. Fastigium of ♂, when seen from dorsum, projecting cephalad of cephalic margin of eyes one-half of width of fastigium (pl. XII, fig. 14); fastigio-facial angle, when seen in profile, very acute, generally slightly concave ventrad (pl. XII, figs. 4 and 8). Antennae markedly spatulate distad. Infraocular portion of genae in ♂ approximately equal to two-thirds of depth of eye, in ♀ subequal to depth of eye. Lateral lobes of pronotum proportionately shorter and deeper. Cerci of ♂ proportionately more robust, sharply and strongly falcate distad.

***Morsea californica tamalpaisensis* Rehn and Hebard**

***Morsea californica californica* Scudder** (Plate XI, fig. 2; XII, figs. 2, 6, 10, 12, 16, 18 and 20; XIII, figs. 2, 6, 8 and 10).

1898. [*Morsea*] *californica* Scudder, Psyche, viii, p. 179. [Cahon Pass, southern California; Mount Wilson, near Los Angeles, California.]

1899. *Morsea californica* Burr, Anal. Soc. Españ. Hist. Nat., xxviii, p. 278. [Same localities.]

1901. *Morsea californica* Bruner, Biol. Cent.-Amer., Orth., ii, p. 25. [Same localities.]

1903. [*Morsea*] *californica* Burr, Genera Insect., Eumastacidae, p. 17. [California.]

1909. *Morsea californica* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1909, p. 420, figs. 6 and 7. [Mount Lowe, Echo Mountain and Mount Wilson, southern California.]

The typical form of *Morsea californica* differs from the subspecies *dunicola* and *tamalpaisensis* in the features indicated under the latter forms.

*Types*.—"Two specimens . . . possibly immature," from Cahon Pass, between the San Gabriel and San Bernardino Mountains, southern California, July 19, and Mount Wilson, San Gabriel Range, southern California, July 27. These specimens are presumably males from the size indicated. The Mount Wilson specimen is here indicated as the single type.

The present location of these specimens is in the Scudder Collection at the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

*Description of Male.*—(Mount Wilson, San Gabriel Mountains, Los Angeles County, California. Elevation, 5000 feet. September 15, 1908. Collected by Fordyce Grinnell Jr. [Acad. Nat. Sci. Phila.]) Size medium. Head with profile of occiput arcuate, elevated appreciably dorsad of the pronotum; fastigium with angle in profile slightly more acute than a right angle, when seen from the dorsum moderately projecting, subtruncate with the lateral angles well rounded; facial line arcuate in profile, the regular curve not broken by a projection to the fastigio-facial angle; frontal costa very strongly indicated, margins markedly carinate, very narrow ventrad of the insertion of the antennae, the marginal carinae subattinent between the antennal bases, sinuate divergent dorsad of the antennae to the fastigium, the floor of the costa in this section plane and with a faint median carinula dorsad; supplementary facial carinae decided, subparallel, continued around ventro-cephalic border of the eyes to the antennal bases; eyes prominent, moderately inflated, ovate in basal outline, the greatest depth of eye slightly more than twice that of the infra-ocular portion of the genae; antennae appreciably longer than the dorsal length of the pronotum, composed of thirteen to fourteen joints, slender, subcylindrical proximad, slightly depressed and subspatulate distad, apex very acute.

Pronotum simple, sellate, with dorsal line practically straight in profile; cephalic margin of disk truncate, caudal margin of disk with a shallow, broad emargination; dorsal carina distinct but low, subobsolete cephalad; cephalad are present faint indications of diverging lateral carinae; lateral lobes distinctly longer than deep, the depth contained nearly twice in the length of the same; cephalic margin and the ventro-cephalic angle broadly arcuate, ventral margin sinuato-truncate, ventro-caudal angle rounded rectangulate, caudal margin truncate; a distinct median subvertical section of a transverse sulcus indicated on the lateral lobes.

Cerci moderately compressed, in section excavate on the internal face, with a convexity on the external face and slightly flattened proximo-dorsad; in form moderately longitudinal, the proximal half subequal in depth and straight, the distal section decurved attenuate to the distinctly aciculate apex, which is not recurved.

Limbs slender. Cephalic femora slightly shorter than the combined length of the head and pronotum, cephalic tibiae subequal to the femora in length. Median femora slightly shorter than the cephalic femora. Caudal femora three-fourths as long as the body, caudal tibiae subequal in length. Caudal tarsi equal to two-fifths of the length of the caudal tibiae, the proximal joint but faintly shorter than the second and third combined, the second about two-thirds the length of the third.

*Description of Female.*—(Mount Lowe, San Gabriel Mountains, Los Angeles County, California. Elevation, 5200 to 5600 feet. August 8, 1907. Collected by M. Hebard. [Hebard Collection.]) The characters here given are those of difference from the male sex.

Size larger. Head with the occiput elevated but little dorsad of the pronotal disk; fastigium with angle in profile slightly more acute than in male, faintly more projecting cephalad, when seen from the dorsum of similar form, but distinctly broader; frontal costa not specially narrowed between the antennal bases, but faintly compressed ventrad of the median ocellus, with very faintest indication of a median carinula dorsad;<sup>5</sup> eyes much less prominent, very sharp ovate in basal outline, the apex dorsad, the cephalic margin flattened arcuate, the caudal margin strongly arcuate, the ventral margin subangulate, greatest depth of eye one and one-third times that of the infra-ocular portion of the genae; antennae approximately subequal to the dorsal length of the pronotum, distinctly shorter than in the male, distal section rather more broadly spatulate than in the male when compared with the slender proximal portion.

Pronotum as a whole proportionately deeper than in the male, the dorsum more tectate in transverse section; cephalic margin of disk arcuato-truncate, caudal margin of disk subtruncate with a shallow, broad, median emargination; dorsal carina moderately elevated, much more distinct than in the male; in the region of the lateral carinae are present low, short, disconnected carinulae, which in general are slightly divergent caudad; lateral lobes with cephalic margin distinctly oblique truncate to the ventro-cephalic angle.

Cephalic femora about one and one-third times as long as the disk of the pronotum. Median femora subequal in length to the median femora. Caudal tibiae faintly longer than the femora.

*Measurements (in millimeters).*—These figures are of maximum and minimum specimens and of others noteworthy for special features.

♂.	Length of body	Length of antenna	Length of pronotum	Length of cephalic femur	Length of median femur	Length of caudal femur
Del Monte, California	8.2	—	1.4	2.7	2.3	7.6
Del Monte, California	8.7	2.3	1.3	2.3	—	7
Del Monte, California	9.7	2.7	1.5	2.6	2.4	7.9
Del Monte, California	10.5	2.7	1.5	2.8	2.4	8.5
Roscoe, California . . . .	11.2	2	1.7	2.4	2.3	8.4
Roscoe, California . . . .	11	2.3	1.7	2.8	2.5	9
Echo Mountain, California . . . . .	9.6	2.3	1.5	2.4	2.2	7.4
Echo Mountain, California . . . . .	10.4	2.3	1.6	2.7	2.3	8.4
Mount Lowe, California . . . . .	11.4	2.4	1.7	2.9	2.6	9
Mount Lowe, California . . . . .	12.2	—	2.2	3.7	3.3	10.4
Mount Wilson, California . . . . .	11	2.8	1.9	3.2	2.9	9
Coahuila, California . . . .	10.9	2	1.5	2.4	2.3	8.4

<sup>5</sup> The margins of the costa may be faintly compressed or completely subparallel in the female sex, the indication of a median dorsal carinula apparent or completely absent.



♀	Length of body	Length of antenna	Length of pronotum	Length of cephalic femur	Length of median femur	Length of caudal femur
Del Monte, California	15.5	1.9	1.8	2.6	2.4	8.6
Del Monte, California	16.8	2.2	2	2.7	2.6	9.2
Roscoe, California . . . .	15.2	1.7	1.9	2.1	2.2	9.3
Roscoe, California . . . .	16.9	1.7	2.1	2.3	2.6	9.8
Echo Mountain, California . . . . .	12.5	—	1.6	2.1	2	8.6
Echo Mountain, California . . . . .	15.4	2	2.1	2.7	2.7	10.2
Mount Lowe, California . . . . .	16.5	2.6	2.6	3.4	3.5	12.2
Mount Lowe, California . . . . .	19	2.2	2.5	2.9	3.1	12
Nellie, California . . . . .	18	2.1	2.3	2.8	3.1	11

*Color Notes.*—This form shows several leading types of basic coloration, each combined, in greater or lesser degree of intensification, with paired dark lateral bars, these latter varying in shade from dark olive-gray to fuscous-black. The base color appears to be entirely independent of the barring and probably is less genetic than the pattern. In its extreme condition the barring consists of broad postocular bars involving almost all of the genae, the lateral lobes of the pronotum, the pleura and sharply defined broad areas on the sides of the abdomen, extending to the apex of the latter. With this is rarely associated a narrow medio-longitudinal bar on the head or pronotal disk. The lateral bars reduce down to faint indications limited to the postocular region, the dorsal section of the lateral lobes of the pronotum and lateral sections of the meso- and metanota. Two pairs of oblique, contrasted dark annuli are evident on the caudal femora in the intensive pattern.

The base color ranges from almost uniform fuscous-black, with no distinctive pattern except pale buffy areas on the ventro-caudal sections of the lateral lobes of the pronotum, to clove brown above, with the face, portions of the lateral lobes, pleura and limbs natal brown and army brown to drab and even pale buff, the caudal femora with striking very pale annuli contiguous to the usual dark ones, the caudal tibiae blotched and mottled with fuscous-black. In the greater majority of all the specimens the whole coloration has a "pepper and salt" frosting or ticking. The gray tendency of the base color runs through olive-gray, in its extreme condition with hoary white ventrad on the lateral lobes, on the pleura and considerable of the caudal femora. The red tendency runs to a uniform kaiser brown or, in combination with a maximum development of the dark lateral bars, to naples yellow on the dorsum of the head, thorax and abdomen with the head and limbs washed to a variable degree with dragon's-blood red or pale brick red. Rarely this latter condition has the limbs naples yellow as well as the dorsum of the body. Numerous combinations of the base colors here given are exhibited by the material, but the more striking types have been mentioned.

The most brilliant coloration is exhibited by three females from Roscoe, California, which were taken on *Eriogonum polifolium*, the pink flowers of which were in blossom. These individuals have the dorsum buffy, heavy lateral bars and the limbs reddish to a variable degree. The Del Monte series shows the uniform reddish (kaiser brown) type and the uniform blackish-fuscon type numerous, the broad, continuous, lateral dark bars rarely indicated in adults. The relatively limited material from high elevations (5000 feet upwards) shows no reddish tendency, grayish or blackish tones predominating.

*Distribution.*—The typical form of the species ranges as far north as Paso Robles Hot Springs, in San Luis Obispo County, California, south at least as far as Nellie in the Agua Tibia Mountains, San Diego County, east at least as far as the Cahon Pass, between the San Gabriel and San Bernardino ranges, and the western foot of the San Jacinto Mountains at Coahuila, Riverside County, California. Material from Del Monte, Monterey County is virtually intermediate between *M. c. californica* and *M. c. tamalpaisensis*. The distribution of *M. c. californica* in all probability covers the coast ranges of south-central and southern California and the San Gabriel range, and is known to extend into suitable areas of the lower country. It will, doubtless, be found to occur in the San Bernardino and San Jacinto Mountains, the Cuyamaca Mountains and other ranges of San Diego and Riverside Counties, California, and northern Lower California.

Its vertical distribution extends, in southern California, from as low as 750 to 900 feet at Verdugo, and 825 feet at Roscoe, up to 5200 feet at Nellie and about 5600 feet on Mount Lowe. At Del Monte it occurs but slightly above the sea-level, on what is really a coast shelf. In southern California its occurrence out of the mountains proper appears to be governed by limited areas of suitable environment.

*Biological Notes.*—This interesting form is a chaparral inhabitant, never really abundant, and in actions it is extremely nimble and vigorous. The chaparral components from which it has been taken are: chamisal (*Adenostoma fasciculatum*), manzanita (*Arctostaphylos tomentosa*) and Nuttalls' Ceanothus (*Ceanothus cuneatus*). (See plate XIV, figs. 1 and 2). It has also been taken on *Eriogonum polifolium* in a desert wash at Roscoe (pl. XV, fig. 1). The usual location of the insect is perched in an exposed position on the upper portions of the

bushes, with the caudal limbs strongly diverging and the short antennae erect. Their saltatorial powers are highly developed and they are not at all easy to capture. Constantly on the alert as they are, a swift sweep of the net is the most successful method of securing them.

The earliest date in the year on which, to our knowledge, adults have been taken is August 8 (Mount Lowe and Echo Mountain), and we have seen no specimens taken later than September 27 (Parker Mountain), but the latter date is probably by no means the end of the season of occurrence, as the insect doubtless occurs much later in the year. Immature material taken June 5 (San Gabriel Mountains) is quite small, while that secured August 8 (Mount Lowe) is as far advanced as the second instar preceding maturity. The latest date we have indicated by immature specimens is September 9 to 10 (Del Monte), where we find the two instars preceding maturity represented.

*Morphological Notes.*—The fastigium, when seen from the dorsum, exhibits some variation in its form, width and also in the degree of production, even in individuals of the same sex from the same locality. In some specimens it is more truncate than in the average, and in others it is broader. Features of limb size variation are mentioned under Remarks. The Del Monte series shows a very appreciable amount of variation in the acuteness of the fastigial angle, when seen from the side, but this is due, according to our interpretation, to intergradation through that series with *M. c. tamalpaisensis*. The exact outline of the eye exhibits some variation in the entire series.

*Remarks.*—Typical *Morsea californica californica* is connected with *M. c. tamalpaisensis* by means of the Del Monte series, which averages intermediate in most of its features, although certain specimens are nearly typical *tamalpaisensis*. The form of the male cerci in the Del Monte series is nearly or quite that of *tamalpaisensis*, but the fastigial and antennal forms are, as a whole, intermediate. An examination of the series before us shows a very decided amount of variation in the proportionate length of the limbs, this being particularly evident in the case of the cephalic and median pairs. This tendency is also more decided in the male than in the female sex. In the Del Monte series the extremes are quite evident, while in the southern Californian

representation the elongation is most marked in those from the higher altitudes, *i. e.* 5000 feet or over. There is, however, very considerable variation in the male Echo Mountain individuals taken at 2700 to 3500 feet. For details of the proportions examine the preceding table of measurements.

*Specimens Examined*: 115; 54 ♂, 51 ♀, 10 immature ♀.

CALIFORNIA: Del Monte, Monterey County, VIII, 20, 1909, (H.; in chaparral on sandy soil), 9 ♂, 4 ♀, 2 immature ♀ : IX, 9–10, 1910, (R. & H.; not uncommon in chaparral, especially on chamisal (*Adenostoma fasciculatum*)), 31 ♀, 26 ♀, 2 immature ♀. Paso Robles Hot Springs, San Luis Obispo County, elevation 900–1100 feet, VIII, 21, 1909, (H.; in chaparral, on *Ceanothus cuneatus*), 1 ♀. Parker Mountain, south-east end of Ventura Range, Los Angeles County, elevation 2800–4100 feet, IX, 27, 1910, (R. & H.; very scarce on slopes), 1 ♂, 1 ♀. Roscoe, Tujunga Wash, Los Angeles County, elevation 825 feet, VIII, 23, 1909, (R. & H.; in part not uncommon on *Eriogonum polifolium*, a bush with dry, pink-white flowers), 2 ♂, 4 ♀. Verdugo, Verdugo Hills, Los Angeles County, elevation 750–900 feet, VIII, 23, 1909, (R. & H.; in high chaparral), 1 ♂, 1 ♀. San Gabriel Mountains, elevation 3500 feet, VI, 5, 1910, (F. Grinnell, Jr.), 1 immature ♀. Mount Wilson, San Gabriel Mountains, Los Angeles County, elevation 5000 feet, IX, 15, 1908, (F. Grinnell, Jr.), 1 ♂, [A. N. S. P.].<sup>6</sup> Mount Lowe, San Gabriel Mountains, Los Angeles County, elevation 5200–5600 feet, VIII, 8, 1907, (H.; on bushes of manzanita (*Arctostaphylos tomentosa*)), 2 ♂, 3 ♀, 4 immature ♀, [Hebard Cln. and A. N. S. P.]: IX, 25, 1910, (R. & H.; on chamisal (*Adenostoma fasciculatum*) and manzanita (*Arctostaphylos tomentosa*)), 1 ♂, 1 ♀. Echo Mountain, San Gabriel Mountains, Los Angeles County, elevation 3200 feet, VIII, 8, 1907, (H.), 1 ♀, [Hebard Cln.]: elevation 2700–3500 feet, VIII, 24, 1909, (R.; on chamisal (*Adenostoma fasciculatum*)), 3 ♂, 1 immature ♀ : IX, 18, 1910, (R. & H.; occasional on chamisal (*Adenostoma fasciculatum*)), 4 ♂, 6 ♀. Coahuila, Coahuila Valley, Riverside County, VIII, 18, 1914, (J. C. Bradley), 1 ♀, [Cornell Univ.]. Nellie, San Diego County, VIII, 30, 1917, (E. P. Hewlett), 1 ♀, [Hebard Cln.].

***Morsea californica dumicola***<sup>7</sup> new subspecies (Plate XII, figs. 3, 7 and 13; XIII, fig. 3).

This more eastern race differs from typical *Morsea californica* in both sexes in the proportionately narrower, but more regularly rounded, basal outline of the eye, in the less projecting fastigium, in the more clavate distal section of the antennae, which in the two forms are of about equal length, in the more robust and less slender limbs and in the more abbreviate caudal tarsi; in the female sex in addition, in the shorter and broader fastigium, par-

<sup>6</sup> Previously recorded by Rehn and Hebard.

<sup>7</sup> From *dumus*, a thicket, and *incola*, inhabitant.

ticularly when viewed from the dorsum, and in the very much more abbreviate caudal tarsi. From *M. c. tamalpaisensis* the present race differs in much the same features as does *M. c. californica*, its relationship being more distant and in general along antithetical lines.

*Type*.—♂; Prescott, Yavapai County, Arizona. August 21, 1917. (J. August Kusche.) [Hebard Collection, Type no. 481.]

*Description of Type*.—The features given are those diagnostic of this sex of the race.

Angle of fastigium in profile very faintly more acute than a right angle, when seen from the dorsum the fastigium is broader and slightly less projecting than in *M. c. californica*: facial line in profile with no appreciable concavity between fastigial angle and insertion of antennae: eyes broad ovate in basal outline: face slightly broader than in *M. c. californica*: antennae with distal section more depressed and distinctly clavate than in typical *californica*.

Lateral lobes of pronotum slightly deeper in proportion to the length than in *M. c. californica*.

Cerci very faintly more sharply decurved distad than in *M. c. californica*, but of the same type.

Limbs slightly but appreciably shorter and faintly more robust than in the typical form of the species. Caudal tarsi shorter proportionately than in *M. c. californica*, the proximal joint appreciably shorter than the second and third joints combined, the second three-fifths of the length of the third.

*Allotype*.—♀; same locality as the type. August 24, 1917. (J. August Kusche.) [Hebard Collection.]

*Description of Allotype*.—The characters given are those diagnostic of this sex of the race. Facial angle in profile differing from that of *M. c. californica* in the same ratio as in the male sex (see figure 7); when seen from the dorsum the fastigium is proportionately broader and shorter, the margin less regularly rounded: face less elongate than in female of *M. c. californica*. Eyes in basal outline faintly broader than in the typical form of the species.

Limbs appreciably shorter than in *M. c. californica*. Caudal tarsi but little longer than one-third of the caudal tibiae.

*Paratype Series*.—We have selected as paratypes forty-three males, and eleven females, taken at Prescott, Arizona, August 21 to 24, 1917, by J. August Kusche.

*Measurements (in millimeters)*.—These figures are of maximum and minimum specimens and of others noteworthy for special features.



♂	Length of body	Length of antenna	Length of pronotum	Length of cephalic femur	Length of median femur	Length of caudal femur
Crestline, Nevada . . . . .	9	—	1.4	2	1.8	7.2
Crestline, Nevada . . . . .	10	1.9	1.5	2.2	2	7.3
Caliente, Nevada . . . . .	11.1	—	1.5	2.2	2.1	7.8
Prescott, Arizona, <i>type</i> . . . .	10.2	2.3	1.6	2.4	2.3	8.1
Prescott, Arizona, <i>paratype</i> . .	9.2	1.8	1.5	2.3	2.1	7.4
Prescott, Arizona, <i>paratype</i> . .	11.5	2.4	1.7	2.7	2.4	8.6
Prescott, Arizona, <i>paratype</i> . .	11	2.4	1.7	2.6	2.4	8.2
Granite Peak, Arizona . . . . .	11.1	2.4	1.7	2.6	2.4	8.1
Senator, Arizona . . . . .	9.7	2.3	1.5	2.6	2.2	8.1
Senator, Arizona . . . . .	10.4	2.3	1.6	2.7	2.6	8.6
♀						
Crestline, Nevada . . . . .	14.5	1.8	2	2	1.9	8.5
Crestline, Nevada . . . . .	16	1.7	2	2.1	2.2	8.9
Caliente, Nevada . . . . .	13.3	1.5	1.7	2.2	2.2	9
Caliente, Nevada . . . . .	14.3	1.6	2.1	2.2	2.2	9.3
Prescott, Arizona, <i>allotype</i> . . .	17	1.9	2.1	2.4	2.3	10
Prescott, Arizona, <i>paratype</i> . .	15	1.8	1.9	—	2.3	9.5
Prescott, Arizona, <i>paratype</i> . .	15	1.7	2	2.5	2.3	9.3
Prescott, Arizona, <i>paratype</i> . .	18.5	—	2.2	2.6	2.8	10
Granite Peak, Arizona . . . . .	17.2	1.7	2	2.3	2.2	10
Mount Union, Arizona . . . . .	18.5	2	2.1	2.6	2.6	10

*Color Notes.*—The material of this race exhibits the same range of color variation found in *M. c. californica*. The base coloration exhibits a more decided tendency toward pinkish buff and pale pinkish buff, and at times even warm buff. The pale tones are more buffy and less reddish than in the typical form of the species. Really dark colored males are seen only in the Crestline series. Several uniformly colored ochraceous-buff and light ochraceous-buff females are in the series, one from Caliente, the other from Prescott, while others from Crestline, Caliente and Prescott approach this condition but have lateral bars indicated to a greater or lesser extent. Females are to a lesser degree blackish than is true in *M. c. californica*, and the "pepper and salt" coloration is less decided in intensity and frequency.

*Distribution.*—This eastern race occurs at localities in the Upper Sonoran Zone in southeastern Nevada and in central Arizona; in the Meadow Valley and Juniper Mountains regions of Lincoln County in the former state, and the Prescott region of Yavapai County in the latter one. It is quite probable it will be found in suitable environments in the intervening country, as conditions at one of the Nevada localities (Crestline) were very similar to those found on the Coconino Plateau region of northern Arizona.

The vertical range of the race is from as low as 4400 feet (Caliente) to at least as high as 6000 feet (Crestline). The upper limit of its distribution in the Prescott region is probably higher than the maximum here given, as Mount Union Peak extends from 6000 feet to practically 8000 feet, but we have no altitudinal information concerning the material from that locality.

*Biological Notes.*—This race is as thamnophilous as the others of this species. At Caliente it occurred on several bushes, one of which was *Kunzia tridentata*, on mountain slopes rising from a wash of Meadow Valley (see plate XVI, fig. 1), while at Crestline it was quite numerous on the same bush growing in open stands of Utah Juniper (*Juniperus utahensis*) and occasional pinyon (*Pinus monophylla*) on the rolling plateau summit of the Juniper Mountains (see plate XVI, fig. 2). Data with certain of the Prescott material show the insect especially preferred thorny bushes in that region.

Apparently this form is represented by immature individuals as late as August 24, but is also adult as early as July 9.

*Morphological Notes.*—The variation in the angle of the fastigium, when seen in profile, is as extensive as in *M. c. californica*, and in the large Prescott series of both sexes this is quite evident. Viewed from the dorsum, however, the characteristically broader and shorter pronotum is less variable.

The material from a relatively high elevation in southern Nevada (Crestline) averages smaller than the central Arizonan series, while that from a lower elevation in the same general region of Nevada in size is more like that from the Arizonan localities.

*Remarks.*—This interesting race is, as far as known, completely isolated in distribution from the other forms of the genus, as we have no knowledge of the occurrence of *Morsea* in any of its races in the extreme desert conditions of western Arizona, southeastern California and the lower or more arid portions of southern Nevada. Its distribution appears to be restricted to portions of the great Arizona plateau region and its northward continuation in southeastern Nevada and probably southern Utah. Its relationship to *M. c. californica* is close and the separation of the two stocks appears to be a relatively recent development.

We believe *M. c. dumicola* is more nearly the primitive stock of the genus, but no demonstrable evidence can be given to support this hypothesis.

*Specimens Examined*: 120; 65 ♂, 49 ♀, 1 immature ♂, 5 immature ♀.

NEVADA: Crestline, Lincoln County, elevation 5900–6000 feet, IX, 4, 1909, (R. & H.; quite numerous on *Kunzia tridentata*, growing in open forest of juniper and occasional pinyon), 6 ♂, 3 ♀. Caliente, Lincoln County, elevation 4400–5200 feet, IX, 3, 1909, (R. & H.; on mountain slopes rising from wash of Meadow Valley, on several species of bushes, one being *Kunzia tridentata*), 1 ♂, 4 ♀.

ARIZONA: Prescott, Yavapai County, elevation 5200–5600 feet, VII, 9–30, VIII, 5–15, 1917, (O. C. Poling), 1 ♂, 22 ♀, 2 immature ♀: VIII, 21–24, 1917, (J. A. Kutsche), 51 ♂, 17 ♀, 3 immature ♀, *type*, *allotype*, and *paratypes*, [Hebard Cln.]. Near Granite Peak, vicinity of Prescott, Yavapai County, VIII, 17, 1917, (J. A. Kutsche), 1 ♂, 2 ♀, 1 immature ♂, [Hebard Cln.]. Mount Union, Yavapai County, VIII, 15, 1917, (J. A. Kutsche), 1 ♀, [Hebard Cln.]. Senator, near Mount Union, Yavapai County, VIII, 11 and 12, 1917, (J. A. Kutsche), 5 ♂, [Hebard Cln.].

***Morsea californica tamalpaisensis*** Rehn and Hebard (Plate XII, figs. 4, 8 and 14; XIII, figs. 4 and 11.)

1909. *Morsea californica tamalpaisensis* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1909, p. 421, figs. 3, 4 and 5. [Mount Tamalpais, Marin County, California.]

This northern race differs from typical *californica* of the Coast Ranges and adjacent region to the southward, and *M. c. dumicola* of Arizona and southern Nevada, in both sexes in the more projecting facial angle (particularly in the male) when seen from the side, in the more acute dorsal and ventral angles of the basal eye outline, in the slightly broader and more projecting fastigium (particularly in the male) when seen from the dorsum, in the proportionately deeper infra-ocular portion of the genae, in the more elongate and more spatulate antennae and in the more ample pronotum, while in the male the lateral lobes of the pronotum are proportionately deeper, and the cerci of the same sex are more incrassate and more sharply hooked distad. In immature specimens the differential features, particularly of the fastigium, are less clearly indicated than in adults.

*Type*.—♂; Mount Tamalpais, Marin County, California. Elevation 2100 feet. August 23, 1907. (M. Hebard.) [Hebard Collection, Type no. 12.]

*Allotype*.—♀; Same data as type. [Hebard Collection.]

The differential characters of this race are given above in the comparative diagnosis.

*Paratypic Series*.—Ten adult males, one adult female and four immature females, all from Mount Tamalpais, August 23, 1907, taken at 1500 and 2100 feet, (M. Hebard), [Hebard Collection and Acad. Nat. Sci. Phila.].

*Measurements (in millimeters)*.—These measurements are of maximum and minimum specimens and of others noteworthy for special features.

	Length of body	Length of antenna	Length of pronotum	Length of cephalic femur	Length of median femur	Length of caudal femur
♂						
Mount Tamalpais, California, <i>type</i> .....	10.2	2.5	1.8	3.1	2.7	8.2
Mount Tamalpais, California.....	10.9	2.8	1.6	2.7	2.5	8
Mount Tamalpais, California, <i>paratype</i> .....	10.5	2.5	1.8	3.1	2.7	8.7
Mount Tamalpais, California.....	10.5	2.8	1.7	3.1	2.7	8.5
♀						
Mount Tamalpais, California, <i>allotype</i> .....	14	1.8	2.1	2.7	2.6	9.5
Mount Tamalpais, California.....	14.4	—	2	2.5	2.5	9
Mount Tamalpais, California.....	15.5	2.3	2.1	2.8	2.8	10
Mount Tamalpais, California.....	17.5	2.3	2.1	2.8	2.7	10.1

*Color Notes*.—When compared with *M. c. californica* the series of the present race is seen to show no individuals with solid or complete dark lateral bars, these being indicated but in part and elsewhere lost in the generally more dark grayish color of the specimens. The males run through hair brown, mouse grays, olive grays and fuscous, with relatively weak contrasts, rarely the dorsum is hoary and occasionally brick red or kaiser brown. The females are occasionally uniform blackish, but the majority are uniform kaiser brown to ochraceous-buff.

*Distribution*.—This geographical race is known only from Mount Tamalpais, at elevations of from 1500 to 2586 (summit) feet. Its range doubtless covers other mountainous areas in the general vicinity of San Francisco Bay, which are of sufficient elevation to carry the required habitat conditions. As shown

under *M. c. californica*, Del Monte material is practically intermediate between the two subspecies.

*Biological Notes.*—The Tamalpaisan form frequents the thick, low chaparral from 1100 to 1500 feet elevation and the heavier, more arborescent chaparral from 1500 feet to the summit (2586 feet) of Mount Tamalpais (see plate XV, fig. 2). The principal components of this chaparral are chamisal (*Adenostoma fasciculatum*) and manzanita (*Arctostaphylos glandulosa*), on both of which *Morsea* occurs as commonly and as vigorous and active as in southern California. The majority of those taken were beaten at 2400 feet. From the data before us it would be fair to assume that the first individuals reach maturity some time before August 17, the earlier of the two dates represented, and also that the form persists well into September at least, as immature specimens were taken on August 23.

*Morphological Notes.*—This race exhibits form variation much of the same character as found in typical *californica*. When seen from the dorsum the fastigium varies quite appreciably in width and in relative degree of production. There is a considerable amount of variation in the antennal length and also in the degree of spatulation and acuteness of the apex.

*Remarks.*—We have discussed under *M. c. californica* the intergradation of the present race and the typical form of the species, as demonstrated by the Del Monte series. The present northwestern extreme development of the genus is clearly a derivative from *M. c. californica*, its intergradation with the latter, its geographic position at the periphery of the generic distribution and away from the center of development of the subfamily in America, and also from the optimum development of the specific entity, make its origin apparent.

*Specimens Examined:* 63; 39 ♂, 12 ♀, 12 immature ♀.

CALIFORNIA: Mount Tamalpais, Marin County, elevation 1100–2586 feet, VIII, 17, 1909, (R. & H.; in chaparral of chamisal and manzanita), 28 ♂, 10 ♀, 8 immature ♀: elevation 1500–2100, VIII, 23, 1907, (H.; on chamisal and manzanita), 11 ♂, 2 ♀, 4 immature ♀, *type*, *allotype* and *paratypes*. [Hebard Cln. and A. N. S. P.].



**PSYCHOMASTAX**<sup>8</sup> new genus

A striking new genus related to *Masyntes* Karsch and *Morsea* Scudder, more nearly related to the latter, but having some important features resembling those of *Masyntes*. The genus is characterized chiefly by its relatively robust, apterous form; the distinct fastigium, which is but moderately produced; the weakly convex facial line; the broad frontal costa, somewhat broader dorsad; pronotum ample, with caudal margin of disk emarginate mesad; the lateral lobes of pronotum deep, rounded (♂) or sharply rectangulate (♀) at the ventro-caudal angle; ovipositor jaws of normal type; male cerci simple, styliform and subgenital segment of the male composed of three parts.

From *Masyntes* (genotype, *M. gundlachi*) the present genus can be distinguished by the uniseriate character of the spine series on the dorsal margins of the caudal tibiae (in this resembling *Morsea*), the less produced and less elongate (dorso-ventrad) head, in the broad but shallowly excavate frontal costa, in the cylindrically incrassate distal half of the antennae, in the rectangulate (♂ and ♀) fastigio-facial angle when seen from the side, in the deep, corcelet-like pronotum (which *Morsea* more nearly approaches), the caudal margin of the disk of which is emarginate and not produced or truncate as in *Masyntes*, in the absence of tegmina and wings (in this respect similar to *Morsea*), in the interspace between the mesosternal lobes being approximately twice as wide as the lobes themselves (instead of but little wider), in the simpler and more normal ovipositor jaws, and in the simple, styliform cerci of the male.

From *Morsea* (genotype, *M. californica*) the new genus differs in the robust and less attenuate form, the shorter and broader head, the rectangulate fastigio-facial angle when seen from the side, in the broader and simpler fastigium when seen from the dorsum, in the much broader and more shallowly excavate, as well as in general more subequal, frontal costa, in the antennal tooth being present on the ninth segment, in the ventro-caudal angle of the lateral lobes of the pronotum being distinctly angulate in the female, in the simple styliform cerci of the male, in the absence of a linguiform process on the dorsal section of the subgenital segment of the same sex.

<sup>8</sup> From ψυχη *spirit*, and *Mastax*.

As a whole *Psychomastax* appears to be a generalized member of the genera group to which *Morsea* and *Masyntes* belong, not as specialized in numerous points of structure as *Morsea*, and also well distinct from *Masyntes*. Superficially there is quite a little resemblance to *Episactus*, particularly in the general form, outline of head, and other features, but more than superficial examination of the two genera shows they have no real relationship.

Genotype.—*Psychomastax psylla* new species.

***Psychomastax psylla***<sup>9</sup> new species (Plate XI, fig. 1; XII, figs. 1, 5, 9, 11, 15, 17 and 19; XIII, figs. 1, 5, 7 and 9.)

*Type*.—♂; Strawberry Valley, San Jacinto Mountains, Riverside County, California. Elevation, 6500 to 7500 feet. August 27, 1909. (J. Rehn; in spiny chaparral.) [Hebard Collection, Type no. 474.]

Size small; form apterous, elongate subfusiform, abdomen subcompressed; surface not polished, on the thorax and abdomen with numerous, small, subobsolete strumosities.

Head with its dorsal length not more than four-fifths of that of the disk of the pronotum; occiput arcuate, ascendent to the vertex, which is plane with the fastigium, the occiput, vertex and fastigium with a weak but continuous medio-longitudinal carination, the vertex regularly narrowing to the fastigium, which projects but little cephalad of the eyes, in width it is relatively broad, subequal to one-half the dorsal width of one of the eyes, the cephalic margin truncate, the lateral angles very narrowly rounded, the cephalic and lateral margins of the fastigium cingulato-carinate, these elevations extending caudad around the internal margin of the eyes: fastigio-facial angle rectangular when seen from the side; facial line regularly arcuate when seen from the side, decidedly retreating; frontal costa relatively broad, subequal except that it slightly widens dorsad a short distance ventrad of the fastigio-facial angle and is also weakly constricted a short distance ventrad of the ocellus, V-sulate except in the widened dorsal portion, where the floor of the costa is broadly elevated within its margins; lateral facial carinae prominent, subparallel ventrad of the eyes, continued around the cephalic margin of the eyes as similar ridges which reach to the fastigium: eyes large, prominent, in depth nearly twice that of the infra-ocular portion of the genae, oval in basal outline: antennae no longer than the depth of the face, composed of twelve articles, the six proximal joints approximately subequal in length, those distad shortened, distal half of the antenna weakly incrassate and subdepressed, apex blunt, tooth on ventral surface of ninth segment.

Pronotum of normal type, expanding caudad, no distinct dorso-lateral carinae present, medio-longitudinal carination weak but continuous; no transverse sulci present; cephalic margin of disk weakly arcuate, caudal mar-

<sup>9</sup> A flea, in allusion to the jumping ability of the species.

gin weakly bisinuate with a broad, shallow, median emargination; caudal width of the entire pronotum slightly greater than the length of the same: lateral lobes of the pronotum with their greatest depth equal to about two-thirds of their dorsal length, dorsal half of the lobes with a group of numerous small strumosities, the ventro-caudal section of the lobes flaring laterad, the ventro-cephalic section slightly curved ventro-mesad; cephalic margin of the lobes regularly arcuate to the ventro-cephalic angle, which is broadly rounded and passes into the truncate ventral margin, ventro-caudal angle rounded rectangulate, caudal margin subtruncate. Tegmina and wings absent. Mesonotum reproducing the structure of the caudal section of the pronotum; metanotum more similar to the abdominal segments in structure, the caudal margin more nearly truncate, median carination evident.

Abdomen with the median carination continuous to the disto-dorsal abdominal segment, on which it is not evident: disto-dorsal abdominal segment with its distal margin faintly arcuate mesad, arcuate-emarginate about the cercal bases: cerci relatively short, not quite reaching the extremity of the subgenital plate, simple, tapering styiform, faintly incurved, apex blunted: supra-anal plate trigonal, with a median carination: subgenital plate or rather segment apparently composed of a pair of lateral plates with the section between made up of soft integument, the plates elongate trigonal in form, the apices, which are dorsal, acute, the whole plate when seen from the caudal aspect in section regularly arcuate toward the median line, the tips of the two plates or sections attingent; the integument median and ventro-caudal in position, its general outline subtrigonal when seen from the caudal aspect; when seen from the lateral aspect the subgenital plate or segment is distinctly deeper than long, when seen from the caudal aspect with the width is faintly greater than the depth. Interspace between the mesosternal lobes strongly transverse, approximately twice as wide as one of the lobes, the cephalic margin of the interspace very broadly obtuse-angulate emarginate, the internal margins of the lobes slightly oblique, the interspace broadening caudad, the interno-caudal angle of the lobes nearly rectangulate: metasternal lobes contiguous, the caudal margin of the meso-metasternal plate broadly obtuse-angulate emarginate.

Cephalic and median limbs slender. Caudal femora moderately elongate, slender, in length subequal to that of the thorax and abdomen combined, tapering, weakly compressed, median dorsal carina minutely serrulate; pagina flattened, pattern distinct but slightly irregular; margin of the genicular extremity with median and lateral spiniform projections, genicular lobes acute: caudal tibiae very faintly longer than the femora, weakly sinuate; spines not regularly biseriata in length, decreasing in length proximad, external margin with fifteen spines, internal margin with thirteen to fourteen spines, of which the distal one is shorter than the others and rather removed from the series, being placed on the distal lamellation of that margin: tibial spurs of the external face short, the dorsal one about twice as long as the ventral one, the former about equal to the distal tibial depth, spurs of the internal face unequal in length, the dorsal one nearly three times the length of the ventral one, the length equal to about two-fifths that of the caudal metatarsus, the distal por-

tion of the dorso-internal spur slightly curved: caudal tarsi slender, in length equal to about two-fifths that of the caudal tibiae; metatarsus equal to one-half the tarsal length, with three pulvilli, one proximal, one post-median and one distal; second joint relatively elongate, but little less than half as long as the metatarsus; arolium large.

*Allotype*.—♀; Same data as type. [Hebard Collection.]

*Description of Allotype*.—Differing from the description of the type in the following features.

Size larger than male: abdominal strumosity more localized proximad.

Head with dorsal length equal to two-thirds of length of pronotal disk; fastigium quite broad, in width subequal to the dorsal width of one of the eyes, extending cephalad of the eyes a distance equal to one-third of the greatest fastigial width, caudal continuations of marginal carinulae of fastigium less decided than in male: frontal costa proportionately broader than in male, margins somewhat more sinuate but of same general form, sulcation more rounded, dorsal portion of costa more decidedly elevated within its margins than in male: eyes less prominent than in male, in depth slightly greater than the infra-ocular portion of the genae, in outline more angulate dorsad and ventrad than in male: antennae short, distinctly shorter proportionately than in male, fourth and remaining joints distad somewhat more elongate than first to third joints.

Pronotum with medio-longitudinal carinulation marked but not greatly elevated; caudal margin of pronotal disk hardly emarginate mesad: lateral lobes of pronotum with ventral margin more oblique than in male, caudal margin sigmoid.

Abdomen more compressed than in male; dorsal carina continuous and marked to supra-anal plate: ovipositor jaws moderately produced, dorsal pair with the dorso-external margin serrulate except near the acute apex, ventral valves with distal section regularly arcuate with the apex acute: subgenital plate with distal margin produced mesad, between the ovipositor valves, into a spiniform process, strongly arcuate-emarginate laterad of this. Interspace between the mesosternal lobes less strongly transverse, the width equal to one and two-thirds the width of one of the lobes: metasternal lobes narrowly separated, the foveolae separate and oblique.

Caudal femora in length equal to about two-thirds that of the abdomen: caudal tibiae with fourteen to eighteen spines on external margin, internal margin with fourteen to fifteen spines.

*Paratypic Series*.—We have before us four adult male, two adult female and one immature male paratypes bearing the same data as the type and allotype. In addition to these we have a female paratype from Coahuila, Riverside County, California.

		Measurements (in millimeters)					
		Length of body	Length of antenna	Length of pronotum	Length of cephalic femur	Length of median femur	Length of caudal femur
♂							
Strawberry Valley, California, <i>type</i> .....	10.8	2.4	1.8	2.6	2.7	8	
Strawberry Valley, California, <i>paratype</i> .....	9.6	2	1.7	2.4	2.3	7.9	
Strawberry Valley, California, <i>paratype</i> .....	9.7	2.2	1.9	2.6	2.5	7.2	
♀							
Strawberry Valley, California, <i>allotype</i> .....	17.2	2	2.5	2.8	2.8	9.5	
Strawberry Valley, California, <i>paratype</i> .....	16	1.9	2.3	2.6	2.6	8.5	
Strawberry Valley, California, <i>paratype</i> .....	18	2	2.6	2.7	2.8	9.6	
Coahuila, California, <i>paratype</i>	18.1	2	2.5	2.7	2.7	9.9	

*Color Notes.*—General dorsal coloration of male varying from dark olive-brown to wood brown, passing to buffy brown on dorsum of abdomen. In the same sex the face, ventral, or at least ventro-cephalic, portion of the lateral lobes and pleura are light ochraceous-buff to light ochraceous-salmon, rarely this area on the thoracic segments is more tawny than the face. Irregularly defined broad lateral postocular bars of blackish fuscous are indicated on the head, pronotum and mesonotum, these frequently incomplete or merely outlined on the lateral lobes of the pronotum. Sterna of the male sex tawny to dresden brown, passing to isabella color on the venter of the abdomen. Cephalic and median limbs of male tawny, mottled with mummy brown to nearly clear ochraceous-tawny, with faint tibial mottlings. Caudal femora of male dull tawny to clear tawny, heavily yet obscurely triannulate with fuscous; caudal tibiae honey-yellow to olive-ocher, clouded to a variable degree with fuscous, darker distad, spines black tipped.

General coloration of female ranging from prout's brown, mottled with a heavy yet poorly defined overcasting of mummy brown, through a dull chestnut brown phase to one with its whole coloration olive-ocher. One female paratype has the face and the dorsal surface of the thorax, abdomen and caudal femora pale chartreuse yellow, the lateral aspects and remainder of the body snuff brown to bister, the latter on the dorso-lateral lines of demarcation. Faint traces of the dark postocular bars of the male are noticeable in all the females except the uniformly pale form. In the female sex the barring of the caudal femora is obscurely indicated. The caudal tibiae are mottled as in the male in all but the bicolored specimen, which has them uniform clay color, the spines black tipped. The pale female has all the femora appreciably but indefinitely barred, as described in the male sex. Eyes of both sexes cinnamon-brown and dresden brown, mottled and sprinkled with fuscous. Antennae of both sexes buckthorn brown to mars brown.

*Distribution.*—This interesting genus and species is known from only two localities, Strawberry Valley, San Jacinto Mountains,



and Coahuila, both in Riverside County, California, and in an air-line but a relatively few miles distant from one another.

*Biological Notes.*—In the San Jacinto Mountains this species was found in an area of Upper Sonoran spiny chaparral, at an elevation of between 6500 and 7500 feet, on the south facing slope of a hog-back ridge southeast of Strawberry Valley, a location where the valley itself and surrounding slopes were covered with Transition pine forests. The area in which it was found has been correctly mapped by Hall<sup>10</sup> and Grinnell and Swarth,<sup>11</sup> in studying respectively the plants and vertebrates of the range. The species was not at all abundant and the material taken was secured only by persistent search, in situations where beating was impossible and sweeping difficult. The species apparently persists well into the month of September, as the presence of one immature female would indicate.

*Morphological Notes.*—The only noteworthy variational features which are evident from the series are in the female sex. The caudal margin of the pronotal disk varies from the type described to one in which the margin is almost straight transverse. The frontal costa in the same sex may show no widening between the antennal bases, or it may have the marked dorsal expansion continuous and evident as far ventrad as the median ocellus. This latter condition occurs in the single Coahuila female. In the male sex there is a very faint indication of a similar variation, but it is not as evident as in the female sex. The number of teeth on the ventro-external margin of the ovipositor jaws varies to as many as six, occasionally differing in the paired jaws.

*Remarks.*—This interesting genus and species is very similar to *Morsea* in habitat and actions, and the two were taken at the same locality (Coahuila), although it is quite probable in different situations. Our information is, however, so limited we can formulate no warranted generalizations regarding the insect.

*Specimens Examined:* 10; 5 ♂, 4 ♀, immature ♀.

CALIFORNIA: Strawberry Valley, San Jacinto Mountains, Riverside County, elevation 6500-7500 feet, VIII, 27, 1909, (R.; in spiny chaparral), 5 ♂, 3 ♀, 1 immature ♀, *type*, *allotype* and *paratypes*. Coahuila, Riverside County, VIII, 18, 1914, (J. C. Bradley), 1 ♀, *paratype*.

<sup>10</sup> A Botanical Survey of San Jacinto Mountain, Univ. of Cal. Publ., Botan., i, pl. 2, (1907).

<sup>11</sup> Univ. of Cal. Publ., Zool., x, no. 10, pl. 6, (1913).

## EXPLANATION OF PLATES

## Plate XI

- Fig. 1.—*Psychomastax psylla* new genus and species. Lateral view of male (*type*). ( $\times 7$ )  
Fig. 2.—*Morsea californica californica* Scudder. Lateral view of male. Mount Lowe, California. ( $\times 6$ )

## Plate XII

- Fig. 1.—*Psychomastax psylla* new genus and species. Lateral view of head and pronotum of male (*type*). ( $\times 5$ )  
Fig. 2.—*Morsea californica californica* Scudder. Lateral view of head and pronotum of male. Mount Lowe, California. ( $\times 5$ )  
Fig. 3.—*Morsea californica dumicola* new subspecies. Lateral view of head and pronotum of male (*type*). ( $\times 7$ )  
Fig. 4.—*Morsea californica tamalpaisensis* Rehn and Hebard. Lateral view of head and pronotum of male (*type*). ( $\times 6$ )  
Fig. 5.—*Psychomastax psylla* new genus and species. Lateral view of head and pronotum of female (*allotype*). ( $\times 7$ )  
Fig. 6.—*Morsea californica californica* Scudder. Lateral view of head and pronotum of female. Mount Lowe, California. ( $\times 7$ )  
Fig. 7.—*Morsea californica dumicola* new subspecies. Lateral view of head and pronotum of female (*allotype*). ( $\times 6$ )  
Fig. 8.—*Morsea californica tamalpaisensis* Rehn and Hebard. Lateral view of head and pronotum of female (*allotype*). ( $\times 6$ )  
Fig. 9.—*Psychomastax psylla* new genus and species. Dorsal outline of antenna of male (*type*). (Greatly enlarged.)  
Fig. 10.—*Morsea californica californica* Scudder. Dorsal outline of antenna of male. Mount Lowe, California. (Greatly enlarged.)  
Fig. 11.—*Psychomastax psylla* new genus and species. Dorsal view of head and pronotum of male (*type*). ( $\times 5$ )  
Fig. 12.—*Morsea californica californica* Scudder. Dorsal view of head and pronotum of male. Mount Lowe, California. ( $\times 5$ )  
Fig. 13.—*Morsea californica dumicola* new subspecies. Dorsal view of head and pronotum of male (*type*). ( $\times 7$ )  
Fig. 14.—*Morsea californica tamalpaisensis* Rehn and Hebard. Dorsal view of head and pronotum of male (*type*). ( $\times 6$ )  
Fig. 15.—*Psychomastax psylla* new genus and species. Outline of cephalic aspect of head of male (*type*). ( $\times 6$ )  
Fig. 16.—*Morsea californica californica* Scudder. Outline of cephalic aspect of head of male. Mount Lowe, California. ( $\times 5$ )  
Fig. 17.—*Psychomastax psylla* new genus and species. Dorsal outline of apex of abdomen of female (*allotype*). ( $\times 5$ )

Fig. 18.—*Morsea californica californica* Scudder. Dorsal outline of apex of abdomen of female. Mount Lowe, California. ( $\times 7$ )

Fig. 19.—*Psychomastax psylla* new genus and species. Lateral outline of apex of abdomen of female (*allotype*). ( $\times 5$ )

Fig. 20.—*Morsea californica californica* Scudder. Lateral outline of apex of abdomen of female. Mount Lowe, California. ( $\times 7$ )

### Plate XIII

Fig. 1.—*Psychomastax psylla* new genus and species. Dorsal view of head and pronotum of female (*allotype*). ( $\times 8$ )

Fig. 2.—*Morsea californica californica* Scudder. Dorsal view of head and pronotum of female. Mount Lowe, California. ( $\times 7$ )

Fig. 3.—*Morsea californica dunicola* new subspecies. Dorsal view of head and pronotum of female (*allotype*). ( $\times 8$ )

Fig. 4.—*Morsea californica tamalpaisensis* Rehn and Hebard. Dorsal view of head and pronotum of female (*allotype*). ( $\times 8$ )

Fig. 5.—*Psychomastax psylla* new genus and species. Outline of cephalic aspect of head of female (*allotype*). ( $\times 7$ )

Fig. 6.—*Morsea californica californica* Scudder. Outline of cephalic aspect of head of female. Mount Lowe, California. ( $\times 7$ )

Fig. 7.—*Psychomastax psylla* new genus and species. Dorsal view of apex of abdomen of male (*type*). (Greatly enlarged.)

Fig. 8.—*Morsea californica californica* Scudder. Dorsal view of apex of abdomen of male. Mount Lowe, California. (Greatly enlarged.)

Fig. 9.—*Psychomastax psylla* new genus and species. Lateral view of apex of abdomen of male (*type*). (Greatly enlarged.)

Fig. 10.—*Morsea californica californica* Scudder. Lateral view of apex of abdomen of male. Mount Lowe, California. (Greatly enlarged.)

Fig. 11.—*Morsea californica tamalpaisensis* Rehn and Hebard. Lateral view of apex of abdomen of male (*type*). (Greatly enlarged.)

### Plate XIV

Fig. 1.—High slopes of San Gabriel Mountains, Los Angeles County, California. View northward from summit of Mount Lowe. Upper portion of region frequented by *Morsea californica californica*. (Photograph by Rehn and Hebard.)

Fig. 2.—Middle slopes of San Gabriel Mountains, Los Angeles County, California. Looking down on Echo Mountain and the lower country about Pasadena. Typical habitat of *Morsea californica californica* in the middle portion of its vertical range. Vegetation largely composed of chamisal (*Adenostoma fasciculatum*) and manzanita (*Arctostaphylos*). (Photograph by Rehn and Hebard.)

## Plate XV

- Fig. 1.—Tujunga Wash, at Roscoe, Los Angeles County, California. Looking toward the Verdugo Hills and, in the distance, the San Gabriel Mountains. Area of extension of range of *Morsea californica californica* along a tongue of suitable environment projecting into the lower country. (Photograph by Rehn and Hebard.)
- Fig. 2.—Chaparral on upper slopes of Mount Tamalpais, Marin County, California. Habitat of *Morsea californica tamalpaisensis*. Chief components of this chaparral are chamisal (*Adenostoma fasciculatum*) and manzanita (*Arctostaphylos*). (Photograph by Rehn and Hebard.)

## Plate XVI

- Fig. 1.—Slopes at Caliente, Lincoln County, Nevada. Walls of lateral canyon of Meadow Valley. Habitat of *Morsea californica dumiicola*. (Photograph by Rehn and Hebard.)
- Fig. 2.—Environment at Crestline, Lincoln County, Nevada. Vegetation chiefly sage and Utah Juniper (*Juniperus utahensis*). Habitat of *Morsea californica dumiicola* at upper limit of its distribution. (Photograph by Rehn and Hebard.)